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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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09/585,682

06/01/2000

Kei-Yu Ko

3526.2US(97-1136.2)

7481

7590

05/05/2004

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EXAMINER

CHU, CHRIS C

ART UNIT

PAPER NUMBER

2815

DATE MAILED: 05/05/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/585,682

Applicant(s)

KO ET AL.

Examiner

Chris C. Chu

Art Unit

2815

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 13 February 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1 - 13 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1 - 13 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Request for Continued Examination***

1. A request for continued examination (RCE) under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on February 13, 2004 has been entered. An action on the RCE follows.

### ***Response to Amendment***

2. Applicant's amendment filed on January 12, 2004 has been received and entered in the case.

### ***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1 - 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Blalock et al. '344 in view of Lur '240.

Regarding claim 1, Blalock et al. discloses in e.g., Fig. 2 and column 6, lines 8 – 30 a semiconductor device, comprising:

- a semiconductor substrate (18) including an active surface;
- at least one conductive line (17) disposed upon the active surface, the at least one conductive line being flanked by sidewall spacers (19);
- a cap (16) disposed over and in contact with the at least one conductive line;
- a passivation layer (14) over the cap that may be composed of doped glass (e.g., column 6, line 14); and
- at least one contact aperture (12a) defined through the passivation layer and including at least one sidewall extending substantially perpendicularly relative to the semiconductor substrate, at least a portion of the at least one sidewall terminating at an interface between the passivation layer and the cap.

Blalock et al. discloses that the cap layer may be composed of silicon nitride, but Blalock et al. does not disclose the material of the cap layer may be undoped silicon dioxide. Lur teaches in e.g., Fig. 3B and column 5, lines 29 – 35 a BPSG layer (26) formed over an etch stop cap layer (28). The material of the cap layer (28) may be undoped silicon dioxide as well as silicon nitride. Thus, it would have been obvious to one of ordinary skill in the art at the time when the invention was made to modify Blalock et al. by using the undoped silicon dioxide as the material of the cap layer as taught by Lur. The ordinary artisan would have been motivated to modify Blalock et al. in the manner described above because Lur teaches that silicon dioxide and silicon nitride were known functionally equivalent materials for etch-stopping BPSG.

As to the language on line 2 of claim 2, “a word line”, applicant should note that this is merely function language that does not differentiate the claimed apparatus from Blalock et al.

Regarding claim 3, Blalock et al. discloses in e.g., Fig. 2 and column 6, lines 8 – 30 the passivation layer (14) comprising doped silicon dioxide.

Regarding claim 4, Blalock et al. discloses in e.g., Fig. 2 and column 6, lines 8 – 30 the passivation layer comprising borophosphosilicate glass, phosphosilicate glass, or borosilicate glass.

Regarding claim 5, Blalock et al. and Lur disclose the undoped silicon dioxide cap being at least partially exposed through the at least one contact aperture.

Regarding claim 6, Blalock et al. discloses in e.g., Fig. 2 and column 6, lines 8 – 30 a semiconductor device, comprising:

- a semiconductor substrate (18);
- at least one insulating structure (16); and
- at least one doped silicon oxide structure (14) over the at least one insulating structure and having at least one sidewall substantially perpendicular to a plane of the semiconductor substrate, at least a portion of the at least one sidewall terminating at an interface between the at least one doped silicon dioxide structure and the at least one insulating structure.

Blalock et al. does not disclose the material of the insulating structure being an undoped silicon dioxide. Lur teaches in e.g., Fig. 3B and column 5, lines 29 – 35 the material of the insulating structure (28) being an undoped silicon dioxide. Thus, it would have been obvious to one of ordinary skill in the art at the time when the invention was made to modify Blalock et al.

by using the undoped silicon dioxide as the material of the insulating structure as taught by Lur. The ordinary artisan would have been motivated to modify Blalock et al. in the manner described above for at least the purpose of (1) providing an etch-stopping layer for the doped silicon dioxide (BPSG) layer, (2) decreasing in capacitance between the interconnect and other interconnects by using the undoped silicon dioxide instead of silicon nitride, and (3) providing a lower dielectric constant by using the undoped silicon dioxide instead of silicon nitride.

Regarding claim 7, Blalock et al. discloses in e.g., Fig. 2 and column 6, lines 8 – 30 the at least one sidewall comprising a sidewall of an aperture (12a).

Regarding claim 8, Blalock et al. discloses in e.g., Fig. 2 and column 6, lines 8 – 30 the at least one sidewall at least partially defines an aperture (12a) through the doped silicon oxide structure (14).

Regarding claim 9, Blalock et al. discloses in e.g., Fig. 2 and column 6, lines 8 – 30 the at least one doped silicon oxide structure comprising borophosphosilicate glass, phosphosilicate glass, or borosilicate glass.

Regarding claim 10, Blalock et al., as modified, discloses in e.g., Fig. 2 and column 6, lines 8 – 30 the at least one undoped silicon oxide structure being at least partially located over a conductive structure (17).

Regarding claim 11, Blalock et al., as modified, discloses in e.g., Fig. 2 and column 6, lines 8 – 30 the at least one undoped silicon oxide structure comprising an insulative cap over a conductive line.

Regarding claim 12, Blalock et al., as modified, discloses in e.g., Fig. 2 and column 6, lines 8 – 30 the insulative cap being partially exposed through an aperture of the at least one doped silicon oxide structure defined by the at least one sidewall.

Regarding claim 13, Blalock et al., as modified, discloses in e.g., Fig. 2 and column 6, lines 8 – 30 the at least one undoped silicon oxide structure being at least partially exposed adjacent the at least one sidewall.

#### ***Response to Arguments***

5. Applicant's arguments with respect to claims 1 and 6 have been considered but are moot in view of the new ground(s) of rejection.

#### ***Conclusion***

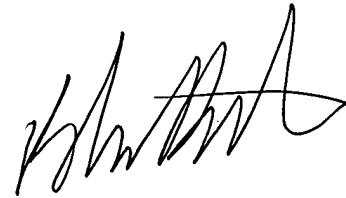
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chris C. Chu whose telephone number is 571-272-1724. The examiner can normally be reached on 11:30 - 8:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on 517-272-1664. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Chris C. Chu  
Examiner  
Art Unit 2815

c.c.  
4/27/04 7:53:30 PM

A handwritten signature in black ink, appearing to read 'Bradley Baumeister', is written over a horizontal line.

**BRADLEY BAUMEISTER  
PRIMARY EXAMINER**